

## Claims

What is claimed is:

1. A bipolar transistor circuit comprising:
  - 5 a primary bipolar transistor;
  - a base resistor through which a bias voltage is applied to the base of the primary bipolar transistor;
  - a current source that drives emitter current through the primary bipolar transistor; and
  - 10 a base bias circuit generating the bias voltage and comprising:
    - a current mirror circuit which tracks current through the current source;
    - a primary biasing bipolar transistor having a  $\beta$  which tracks the  $\beta$  of the primary bipolar transistor and which receives current through the current mirror circuit to develop the bias voltage; and
    - 15 a secondary biasing circuit comprising a secondary biasing bipolar transistor having a  $\beta$  which tracks the  $\beta$  of the primary bipolar transistor, the secondary biasing bipolar transistor receiving current from the current mirror circuit, changes in base current to the secondary
    - 20 biasing bipolar transistor causing changes in current to the primary biasing bipolar transistor.
2. The circuit of Claim 1 further comprising a bias resistor coupled between the bias voltage and the base of the primary biasing bipolar transistor, the bias resistor tracking resistance variations in the base resistor.
- 25 3. The circuit of Claim 1 wherein the primary bipolar transistor, the primary biasing bipolar transistor and the secondary biasing bipolar transistor are NPN.

4. The circuit of Claim 1 wherein the primary bipolar transistor, the primary biasing bipolar transistor and the secondary biasing bipolar transistor are PNP.
5. The circuit of Claim 1 wherein the primary bipolar transistor is one of a pair of bipolar transistors in a differential amplifier.
6. The circuit of Claim 1 wherein the primary bipolar transistor is one of a plurality of bipolar transistors in a differential voltage controlled oscillator.
- 10 7. The circuit of Claim 1 wherein the current mirror circuit includes a first current mirror which provides collector current to the primary biasing bipolar transistor and a second current mirror which tracks base current through the secondary biasing bipolar transistor.
- 15 8. A method for biasing a bipolar transistor comprising the steps of:
  - driving emitter current from a current source through a primary bipolar transistor;
  - generating a bias voltage by tracking current through the current source in a current mirror circuit the current received through the current mirror circuit
  - 20 by a primary biasing bipolar transistor having a  $\beta$  which tracks the  $\beta$  of the primary bipolar transistor;
  - tracking changes in current to the primary biasing bipolar transistor by a secondary biasing circuit comprising a secondary biasing bipolar transistor having a  $\beta$  which tracks the  $\beta$  of the primary bipolar transistor, the secondary
  - 25 biasing bipolar transistor receiving current from the current mirror circuit, changes in base current to the secondary biasing bipolar transistor causing changes in current to the primary biasing transistor; and
  - applying the bias voltage through a base resistor to the base of a primary bipolar transistor.

9. The method of Claim 1 further comprising:  
tracking resistance variations in the base resistor through a bias resistor  
coupled between the bias voltage and the base of the primary biasing bipolar  
5 transistor.
10. The method of Claim 1 wherein the primary bipolar transistor, the primary  
biasing bipolar transistor and the secondary biasing bipolar transistor are NPN  
type.
- 10 11. The method of Claim 1 wherein the primary bipolar transistor, the primary  
biasing bipolar transistor and the secondary biasing bipolar transistor are PNP.
12. The method of Claim 1 wherein the primary bipolar transistor is one of a pair of  
15 bipolar transistors in a differential amplifier.
13. The method of Claim 1 wherein the primary bipolar transistor is one of a  
plurality of bipolar transistors in an oscillator.
- 20 14. The method of Claim 1 wherein the current mirror circuit includes a first current  
mirror which provides collector current to the primary biasing bipolar transistor  
and a second current mirror which tracks base current through the secondary  
biasing bipolar transistor.
- 25 15. An apparatus for biasing a bipolar transistor comprising:  
means for driving emitter current from a current source through a  
primary bipolar transistor;  
means for generating a bias voltage by tracking current through the  
current source in a current mirror circuit the current received through the current

mirror circuit by a primary biasing bipolar transistor having a  $\beta$  which tracks the  $\beta$  of the primary bipolar transistor;

means for tracking changes in current to the primary biasing bipolar transistor by a secondary biasing circuit comprising a secondary biasing bipolar transistor having a  $\beta$  which tracks the  $\beta$  of the primary bipolar transistor, the secondary biasing bipolar transistor receives current from the current mirror circuit, changes in base current to the secondary biasing bipolar transistor causing changes in current to the primary biasing transistor; and

means for applying the bias voltage through a base resistor to the base of a primary bipolar transistor.

16. A bipolar transistor circuit comprising:

a primary bipolar transistor;

a base resistor through which a bias voltage is applied to the base of the primary bipolar transistor;

a current source that drives emitter current through the primary bipolar transistor; and

a base bias circuit generating the bias voltage and comprising:

a current mirror circuit which tracks current through the current source;

a primary biasing bipolar transistor having a  $\beta$  which tracks the  $\beta$  of the primary bipolar transistor and which receives current through the current mirror circuit to develop the bias voltage; and

a bias resistor coupled between the bias voltage and the base of the primary biasing bipolar transistor, the bias resistor tracking resistance variations in the base resistor.

17. The circuit of Claim 1 wherein the primary bipolar transistor and the primary biasing bipolar transistor are NPN.
18. The circuit of Claim 1 wherein the primary bipolar transistor and the primary  
5 biasing bipolar transistor are PNP.
19. The circuit of Claim 1 wherein the primary bipolar transistor is one of a pair of bipolar transistors in a differential amplifier.
- 10 20. The circuit of Claim 1 wherein the primary bipolar transistor is one of a plurality of bipolar transistors in an oscillator.